UNITED STATES PATENT AND TRADEMARK OFFICE

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10/817,551	04/02/2004	Yong-Shik Shin	SHIN1.007AUS	2525

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KNOBBE MARTENS OLSON & BEAR LLP	REDDING, THOMAS M
2040 MAIN STREET	

FOURTEENTH FLOOR	ART UNIT	PAPER NUMBER
IRVINE, CA 92614	2624	

NOTIFICATION DATE	DELIVERY MODE
06/26/2007	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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		Application No.	Applicant(s)
Office Action Summary		10/817,551	SHIN, YONG-SHIK
		Examiner	Art Unit
		Thomas M. Redding	2624

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE **3** MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-5* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1 and 2* is/are rejected.

7)☒ Claim(s) *3-5* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☒ All   b)☐ Some * c)☐ None of:

      1.☒ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☒ Information Disclosure Statement(s) (PTO/SB/08)
    Paper No(s)/Mail Date *4/02/04, 3/18/05, 6/05/06*.

4)☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____.

5)☐ Notice of Informal Patent Application

6)☐ Other: _____.

DETAILED ACTION

Specification

1.   The disclosure is objected to because of the following informalities: In the mathematics described on pages 8 – 11, it is apparent that the type style of the font used for at least some of the variables has significance. Although the intent is not clear from the disclosure, it is apparent that gray level variables G_{max} and g_{max} are two different entities (e.g. G_{max} is explicitly set to g_{max}). The variable "p" however seems to be written randomly in upper and lower case and from usage appears to be intended to be the same variable (array). This occurs in multiple places, but for illustration, the pseudo code in table 2 uses lower case 'p' everywhere except for an assignment in the last set statement where it appears as an upper case letter. Please review the specification and fix the inconsistencies.

Table 1 in the disclosure also has a couple of typographical errors in the equation given for the Shannon entropy measure. The denominator is listed as "MNln(s)" and it should be "MNln(2)". The final term is listed as $[1 - \mu_i(i(x,y))]*[1 - \ln(\mu_i(i(x,y)))]$. There is an error in this term as well, $[1 - \mu_i(i(x,y))]*[\ln(1 - \mu_i(i(x,y)))]$ would seem to be the intended form.

Appropriate correction is required.

Request for Further References

2.   The examiner deems the material on fuzzy entropy and fixed point iteration as described in the background to be pertinent to patentability and requests copies of any relevant references the applicant may be aware of.

Claim Objections

3.   Claim 5 is objected to because of the following informalities:

Claim 5 has a period in the first line, "The method as recited in claim 2. ...". The period should be changed to a comma as it is in the other dependent claims to avoid being interpreted as an end of sentence. The claim should read "The method as recited in claim 2, ..."

Step c-ix in claim 5 also describes "*reputedly* performing steps c-ii to c-viii". It seems more likely that the intended word was "repeatedly" as in "*repeatedly* performing steps c-ii to c-viii" and the claim will be interpreted as such for the remainder of this action.

Claim 5 also shows the inconsistencies in the type style of the "p" variable described above regarding the specification. For purposes of this action, "p" and "P" will be assumed to mean the same array.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

4.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that

form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5.   Claims 1 and 2 are rejected under 35 U.S.C. 102(b) as being anticipated by

Sahoo et al. (Optical Engineering, Vol 37 July 1977).

        Regarding claim 1, Sahoo working in the same field of endeavor of image

segmentation using histogram entropy, teaches [a] method for finding a threshold value

in image segmentation, the method comprising the steps of:

        a) gaining histogram distribution of an image ("... we extend the proposed

entropy crossover method using a 2-D histogram of the image", Sahoo, section

3.3, line 1)

        b) computing entropy values corresponding to gray levels in the histogram ("The

optimal threshold can be easily be (sic) determined by finding the gray level

where the two entropy functions cross", Sahoo, section 3.2, line 16)

c) gaining a minimum entropy value corresponding to the gray level as a threshold value by using a fixed point iteration FPI based on the computed entropy values ("When we threshold an image at the gray level t, ...", Sahoo, section 3.2 line 1 and "... the optimal threshold is t* is obtained minimizing E(t)", Sahoo, section 3.2, line 8, the process of minimizing E(t) is not given in explicit detail, but in the simplest case would involve repeating (or iterating) calculations varying t until a minimal E(t) was found).

Regarding claim 2, Sahoo describes steps correspond to element "c" above of

c-1) obtaining a plurality of possible optimal thresholds ("... the optimal threshold is t* is obtained minimizing E(t)", Sahoo, section 3.2, line 8, the process of minimizing E(t) is not given in explicit detail, but in the simplest case would involve repeating (or iterating) calculations varying t until a minimal E(t) was found)

c-2) obtaining entropy values of gray levels corresponding to the obtained possible optimal thresholds (see comment above about repeating calculations); and

c-3) obtaining the threshold value by comparing entropy values and selecting minimum entropy value ("... the optimal threshold is t* is obtained minimizing E(t)", Sahoo, section 3.2, line 8).

Claim Rejections - 35 USC § 103

6.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7.   Claims 1 and 2 are rejected under 35 U.S.C. 103(a) as being unpatentable over

applicant's admitted prior art and Strang (**Calculus**, Wellesley Cambridge Press).

Regarding claim 1, applicant described [a] method for finding a threshold value in

image segmentation (figure 1), the method comprising the steps of:

a) gaining histogram distribution of an image (figure 1, reference 101)

b) computing entropy values corresponding to gray levels in the histogram (figure

1, reference 102)

c) gaining a minimum entropy value corresponding to the gray level as a

threshold value calculated based on the computed entropy values (figure 1, reference

103).

Applicant's prior art does not expressly teach using fixed point iteration as a means of calculating the threshold values.

Strang, working in a related problem area of mathematics, teaches the use of iteration to solve equations ("*If the iterations $x_{n+1} = F(X_n)$ converge to x^*, then $x^* = F(x^*)$*", Strang, page 130, paragraph 11).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to combine the segmentation method of the prior art with the iteration method of solving equations described by Strang as "It [iteration] is a fundamental technique in scientific computing", Strang, page 133, paragraph 6). It also would be a simple and computationally efficient means to solve a non-linear equation.

Regarding claim 2, the combination of applicant's prior art and Strang teach the elements of claim 1. Further, applicants admitted prior art teaches:

c-1) obtaining a plurality of possible optimal thresholds (figure 1 reference 102, considering all grey levels as potential thresholds would provide a plurality of possible optimal thresholds);

c-2) obtaining entropy values of gray levels corresponding to the obtained possible optimal thresholds (figure 1, reference 102, calculating entropy for each gray level would includes possible optimal thresholds); and

c-3) obtaining the threshold value by comparing entropy values and selecting minimum entropy value (figure 1, reference 103). The fact that the applicant is working

with a subset of the full range really doesn't alter the method of comparing entropies

and finding a minimum within the population.

Allowable Subject Matter

8.   Claims 3, 4 and 5 are objected to as being dependent upon rejected base claims,

but would be allowable if rewritten in independent form including all of the limitations of

the base claims and any intervening claims.

Conclusion

Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Thomas M. Redding whose telephone number is (571)

270-1579. The examiner can normally be reached on Mon - Fri 7:30 am - 5:00 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Brian P. Werner can be reached on (571) 272-7401. The fax phone number

for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the

Patent Application Information Retrieval (PAIR) system. Status information for

published applications may be obtained from either Private PAIR or Public PAIR.

Status information for unpublished applications is available through Private PAIR only.

For more information about the PAIR system, see http://pair-direct.uspto.gov. Should

you have questions on access to the Private PAIR system, contact the Electronic

Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a

USPTO Customer Service Representative or access to the automated information

system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/TMR/

/Brian P. Werner/
Supervisory Patent Examiner, Art Unit 2624